

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY



(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 25 JAN 2006

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Applicant's or agent's file reference MNH/23248	<b>FOR FURTHER ACTION</b>		See Form PCT/PEA/416
International application No. PCT/GB2004/004535	International filing date (day/month/year) 27.10.2004	Priority date (day/month/year) 04.11.2003	
International Patent Classification (IPC) or national classification and IPC F16K7/12			
Applicant CRANE PROCESS FLOW TECHNOLOGIES LIMITED et al			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 4 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau) a total of 4 sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand  23.03.2005		Date of completion of this report  24.01.2006	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized Officer  Bilo, E  Telephone No. +49 89 2399-8187 	

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/GB2004/004535

**Box No. I Basis of the report**

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

**Description, Pages**

1-14 as originally filed

**Claims, Numbers**

21 as originally filed  
1-20 received on 23.03.2005 with letter of 21.03.2005

**Drawings, Sheets**

1/17-17/17 as originally filed

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
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International application No.  
PCT/GB2004/004535

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	1-20
	No: Claims	
Inventive step (IS)	Yes: Claims	1-20
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-20
	No: Claims	

2. Citations and explanations (Rule 70.7):

**see separate sheet**

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement**

**1. Document**

Reference is made to the following document:

D1: US-A-4 044 990 (SUMMERFIELD FRANCIS) 30 August 1977 (1977-08-30)

**2. Novelty/inventive step**

The document D1 is regarded as being the closest prior art to the subject-matter of **claim 1** and shows (the references in parentheses applying to this document) a diaphragm valve comprising: a valve body (120); a diaphragm (180) which is sealed to the valve body (120) to define a flow passage which extends between an inlet port and an outlet port, both defined by the valve body (120); and an operating mechanism secured to the valve body (120) for moving the diaphragm (180) into sealing engagement with a seat (bottom of diaphragm) provided on the valve body in order to close the flow passage to fluid flow

The subject-matter of claim 1 **differs** from document D1 in that the valve body and diaphragm are integrally formed as a disposable assembly having a relatively less flexible region with a weir extending across the passage which forms a valve seat and a relatively more flexible region which forms the diaphragm which may be forced into engagement with the valve seat to close the flow passage to fluid flow, and a housing is provided for mechanically supporting the region of the valve body in which the seat area is defined.

The subject-matter of claim 1 is therefore new and inventive (Article 33(2)(3) PCT).

**Claims 2-20** are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

**CLAIMS:**

1. A diaphragm valve (1) comprising: a valve body (2); a diaphragm (12) which is sealed to the valve body (2) to define a flow passage (9) which extends between an inlet port (7) and an outlet port (8), both defined by the valve body (2); and an operating mechanism secured to the valve body (2) for moving the diaphragm (12) into sealing engagement with a valve seat (11) provided on the valve body (2) in order to close the flow passage (9) to fluid flow, characterised in that the valve body (2) and diaphragm (12) are integrally formed as a disposable assembly having a relatively less flexible region with a weir extending across the passage (9) which forms the valve seat (11) and a relatively more flexible region (12) which forms the diaphragm which may be forced into engagement with the valve seat (11) to close the flow passage (9) to fluid flow, and a housing (3) is provided for mechanically supporting the region of the valve body in which the seat area is defined.

2. A diaphragm valve (1) according to claim 1, wherein said housing (3) has a longitudinal through opening formed therein in which at least the region of the valve body in which the seat area is defined is mounted so as to support said region.

3. A diaphragm valve (1) according to claim 1 or claim 2, wherein said housing includes an aperture in the region of the diaphragm (12) in which said operating mechanism engages.

4. A diaphragm valve (1) according to any of the preceding claims, wherein said housing is formed by an upper support member (4) having a lower surface which engages an upper surface of said region of the valve body, and a lower support member (5) having an upper surface which engages a lower surface of said region of the valve body, said upper and lower surfaces of said support members (4, 5) being of complementary shape to the respective upper and lower surfaces of the said region.

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5. A diaphragm valve (1) according to claim 4, wherein said support members (4, 5) define between each other a through opening through which said valve body extends.

6. A diaphragm valve (1) according to any of the preceding claims, wherein the region of the valve body (2) in which the seating area is defined has an upper wall and a lower wall, the upper wall being flexible and forming the diaphragm (14), and the lower surface being rigid and its inner surface forming the valve seat (11).

7. A diaphragm valve (1) according to claim 6, wherein said upper wall is thinner than said lower wall so as to be more flexible.

8. A diaphragm valve (1) according to claim 6 or claim 7, wherein said upper wall is of a different shape to said lower wall such that said upper wall is more flexible than said lower wall.

9. A diaphragm valve (1) according to any of claims 6 to 8, wherein said lower wall includes reinforcing means which increases its stiffness.

10. A diaphragm valve (1) according to any of claims 6 to 9, wherein said upper wall is formed of a more flexible material than said lower wall.

11. A diaphragm valve (1) according to any of the preceding claims, further including a pair of wings (13, 14) which extend laterally outwards from opposite sites of the valve body in the region of the valve seat.

12. A diaphragm valve (1) according to claim 11, where said wings (13, 14) extend longitudinally along the valve body and taper laterally towards said valve body (2) towards each end thereof so as to have a maximum width in the region of the valve seat (12).

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13. A diaphragm valve (1) according to any of claims 1 to 12, wherein the diaphragm (12) is formed separately to and is sealingly welded to valve body (2); in particular by welding.

14. A diaphragm valve (1) according to any of the preceding claims wherein the diaphragm (12) is formed of a different material or different grade of material, in particular a different polymer or different grade of polymer, than at least the region of the valve body (2) which forms the valve seat (11).

15. A diaphragm valve (1) according to any of the preceding claims, wherein said housing (3) includes marking means which permanently marks the valve body upon mounting of the valve body therein so as to identify the valve body as having been used.

16. A diaphragm valve (1) according to claim 16, wherein marking means damages said valve body so as to prevent its reuse.

17. A diaphragm valve (1) according to any of the preceding claims, wherein said operating means (32) is mechanically coupled to said diaphragm such that upon movement of the operating means (32) towards the valve seat the diaphragm (12) is pressed by the operating means (32) against said valve seat (11) and upon movement of the operating means (32) away from the valve seat (11) the diaphragm is pulled away from the valve seat (11).

18. A diaphragm valve (1) according to claim 17, wherein a coupling means, in particular a cup (40), is formed, in particular integrally formed, on said diaphragm (12), which couplingly engages, in particular is a snap fit, with complementary coupling means, in particular a button (42) carries on the operating means (32).

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19. A diaphragm valve (1) according to claim 18, wherein said diaphragm (12) is coupled to the operating means (32) in such a manner that the coupling means formed on the diaphragm is damaged upon uncoupling the diaphragm from the operating means (32), thereby prevent reuse of the valve body (2).

20. A diaphragm valve (1) according to any of the preceding claims, wherein the valve body is profiled to include a flat invert surface (24) extending through the body from the inlet port (7) to the outlet port (8) such that the valve body is self draining.

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